REMARKS/ARGUMENTS

Election/Restrictions

Applicant affirms the election of Group I, claims 1-31 and 59-67, without traverse.

Claims define allowable subject matter over the applied art

Applicant respectfully traverses the rejection of Claims 1, 22, 31, and 59 under 35 USC 102(b) as being anticipated by Shirahama et al. (US Pat. No. 5,446,645) and Change (US Pat. No.5,909,367). Applicant respectfully submits that Shirahama does not teach or disclose the independent Claims 1, 22, 31, and 59 recitations of (with emphasis added):

1. ... **common mode chokes**, each coupled to a respective power converter;

local cross current detectors, each configured for obtaining common mode cross currents from a respective output line of a respective power converter;

local cross current feedback controllers, each configured for receiving the common mode cross currents from respective local cross current detectors, calculating a resultant cross curr nt, and generating a local feedback control signal (34); and

local converter controllers, each configured for using a respective local feedba k control signal to drive the respective power converter in accordance with a coordinated switching pattern with respect to the other power converters.

22. ... **common mode chokes, each** coupled to a respective power converter and comprising an integrated magnetic AC link choke;

local cross current detectors, each configured for obtaining a common mode cross current from a respective output line of a respective power converter;

local cross current feedback controllers, each configured for receiving the common mode cross currents from respective local cross current detectors, calculating a resultant cross current, and generating a local feedback control signal;

a global feedforward controller, configured for detecting switching patterns of th power converters and generating counter balance zero-sequence global feedforward control signals; and

local converter controllers , each configured for using a respective local feedback control signal and a respective global feedforward control signal to drive the respective power converter in accordance with an interleaved switching pattern with respect to the other power converters.

31. ... **common mode chokes,** ach coupl d to a respective power converter ;

local cross current detectors, each configured for obtaining a common mode cross current from a respective output line of a respective power converter;

local cross current feedback controllers, each configured for receiving the common

mode cross currents from respective local cross current detectors, calculating a resultant cross current, and generating a local feedback control signal;

a global feedforward controller configured for detecting switching patterns of the power converters and generating counter balance zero-sequence global feedforward control signals;

a global cross current feedback controller configured for receiving the common mode cross currents from the local cross current detectors, calculating a resulting global cross current, and generating global feedback control signals ; and

local converter controllers, each is configured for using a respective local feedback control signal, a respective global feedback control signal and a respective global feedforward control signal, to drive the respective power converter in accordance with an interleaved switching pattern with respect to the other power converters.

59. A method of controlling cross-current through multiple, parallel-coupled power converters, comprising:

providing common mode chokes, each coupled to a respective power converter;

obtaining common mode cross currents from output lines of the power converters; and for each respective power converter,

calculating a resultant cross current by using the respective common mode cross currents,

generating a local feedback control signal by using the resultant cross current,

driving the respective power converter by using the respective local feedback control signal in accordance with a coordinated switching pattern with respect to the other pow r converters.

For anticipation under 35 USC 102, the reference must teach every aspect of the claimed invention, either explicitly or impliedly.

With respect to claim 1, Shirahama does not disclose, teach, or suggest, either explicitly or impliedly, the above highlighted limitations of a cross current control system, namely common mode chokes, local cross current feedback controllers, and local converter controllers. With respect to claim 22, Shirahama does not disclose, teach, or suggest, either explicitly or impliedly, the above highlighted limitations of a cross current control system, namely common mode chokes, local cross current feedback controllers, local converter controllers, and a global feedforward controller. With respect to claim 31, Shirahama does not disclose, teach, or suggest, either explicitly or impliedly, the above highlighted limitations of a cross current control system, namely common mode chokes, local cross current feedback controllers, local converter controllers, global feedforward controller and a global cross current feedback controller. Also the cross-current controlling technique in Shirahama does not involve providing common mode chokes, generating local feedback control signal by using the resultant cross current and driving the respective power converters by using the respective local feedback control signal in accordance with a coordinated switching pattern with respect to the other power converters, as described in Claim 59 (also highlighted above) of Applicant's invention.

In contrast, Shirahama appears to describe an apparatus for controlling parallel running of inverters, wherein the cross current is suppressed by an entirely distinct method which includes calculating successive voltage differences in the circuitry provided in Shirahama, by first converting the cross current signal into a voltage signal using a second difference detection means, and detecting an output which is a difference between this voltage signal and the output voltage signal of a parallel running control circuit, then calculating a difference between this output and the voltage output of the inverter. A controller is then used for controlling the duty of the inverter such that this difference is minimized (column 2, lines 53-65, and column 3, lines 45-52).

Further, Change is devoid of any disclosure, teaching or suggestion regarding the cross current control system or technique as described in the independent claims 1, 22, 31 and 59 of the Applicants invention. Specifically, with respect to claim 1, Change does not disclose, teach or suggest either explicitly or impliedly the common mode chokes, local cross current detectors, local cross current feedback controllers and local converter controllers. With respect to claim 22, Change does not disclose, teach or suggest either explicitly or impliedly the common mode chokes, local cross current detectors, local cross current feedback controllers, local converter controllers, and a global feedforward controller. With respect to claim 31, Change does not disclose, teach or suggest either explicitly or impliedly the common mode chokes, local cross current detectors, local cross current feedback controllers, local converter controllers, global feedforward controller, and a global cross current feedback controller. With respect to claim 59, Change does not disclose, teach or suggest, either explicitly or impliedly, a method of controlling cross-current through multiple, parallel-coupled power converters which includes providing common mode chokes, obtaining common mode cross currents from output lines of the power converters; and for each respective power converter, calculating a resultant cross current by using the respective common mode cross currents, generating a local feedback control signal by using the resultant cross current, and driving the respective power converter by using the respective local feedback control signal in accordance with a coordinated switching pattern with respect to the other power converters.

Change appears to describe a multi-module AC-AC power converter for converting fixed voltage and fixed frequency isolated multi-phase power to an integrated variable voltage and variable frequency multi-phase output (column 2, lines 43-50). There is no mention about the cross current control in the apparatus or technique described in Change.

Accordingly, Applicant respectfully submits that independent Claims 1, 22, 31 and 59 define allowabl subject matter over the applied art. Withdrawal of the rejections is respectfully requested, and allowance of the Claims is respectfully solicited.

If the Examiner continues to believe the above-discussed elements are present in ither or both reference, Applicant respectfully requests that the Examiner mak a more explicit statement as to the location of such elements in the reference(s).

Applicant respectfully traverses the rejection of Claims 2-21, 23-30 and 60-67 under 35 USC 103(a) as being unpatentable over Shirahama et al. (US Pat. No. 5,446,645) in combination with Kitahata et al. (US Pat. No.6,169,677). Each of these rejected dependent claims depends from an independent claim which Applicant believes to be in condition for allowance over Shirahama for the reasons discussed above regardless of what Kitahata might be interpreted to teach or suggest. In addition, Applicant respectfully submits that neither Shirahama nor Kitahata taken individually or collectively teach, suggest, or disclose the limitations highlighted above in the recitations of independent Claims 1, 22, 31, and 59.

To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art.

As discussed hereinabove Shirahama does not teach, suggest or disclose claim limitations directed towards common mode chokes, local cross current feedback controllers, a global feedforward controller, local converter controllers as recited in claims 1, 22, and the method of controlling cross current as recited in claim 59.

Further, Kitahata, appears to describe a method for suppressing cross currents using voltage dividing transformers (column 3, line 25-27, 39-44) in contrast with using common mode chokes as described in independent claims 1, 22 and 59 of the Applicant's invention. Kitahata is devoid of any teaching or suggestion regarding using the common mode chokes for suppressing the cross currents. The voltage dividing transform rs in Kitahata appear to be used to parallel-multiplex the outputs of the power converters, and the magnetic flux in the iron core of the transformer provides impedance to suppress the cross current (column 3, lines 45-57). There is no teaching or suggestion in Kitahata for using common mode chokes as described in the embodiments of Applicant's invention and as recited in independent claims 1, 22, and 59. Therefore, no combination of Shirahama with Kitahata would lead to Applicant's invention as recited in the independent claims.

Accordingly, Applicant respectfully submits that the Office Action did not make a prima facie case of obviousness for the independent claims 1,22, and 59.

Claims 2-21 depend directly or indirectly from claim 1, claims 23-30 depend directly or indirectly from claim 22 and claims 60-67 depend directly or indirectly from claim 59. Applicant respectfully submits that claims 1, 22 and 59 are patentably distinct from the applied references for the reasons discussed above and that claims 2-21, 23-30, and 60-67 are similarly allowable over the applied references.

Summary

In view of the foregoing, Applicant respectfully submits that the application is in condition for allowance. Favorable reconsideration and prompt allowance of the application are respectfully requested.

Should the Examiner believe that anything further is needed to place the application in even better condition for allowance, the Examiner is requested to contact applicant's undersigned representative at the telephone number below.

Respectfully submitted,

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